

PATENT
Attorney Docket No. 401188/Fukami

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

MISUMI et al.

Application No.: 09/848,256

Art Unit: 2811

Filed: May 4, 2001

Examiner: L. Thai

For: SEALED SEMICON-
DUCTOR DEVICE
AND LEAD FRAME
USED FOR THE SAME

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RESPONSE TO OFFICIAL ACTION

Commissioner for Patents
Washington, D. C. 20231

Dear Sir:

In response to the Official Action dated November 1, 2001, please enter the following amendments and consider the following remarks.

AMENDMENTS

IN THE CLAIMS

Cancel claims 1-3 and 12-15 and replace the indicated claims with:

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4. (Twice Amended) A sealed semiconductor device comprising:
a semiconductor chip; and
a lead frame including internal leads extending across part of and spaced from a surface of said semiconductor chip, wherein at least one of said internal leads includes a protrusion protruding toward and contacting the surface of said semiconductor chip.

5. (Twice Amended) The sealed semiconductor device according to claim 4, wherein said protrusion is an end of at least one of said internal leads that includes a bend proximate the end.

B₂

6. (Twice Amended) The sealed semiconductor device according to claim 4, wherein said protrusion includes a bent portion of one of said internal leads spaced from an end of said internal lead.

7. (Twice Amended) The sealed semiconductor device according to claim 4, wherein said internal leads include active internal leads electrically connected with wires to said semiconductor chip and said protrusion is part of a dummy internal lead not connected by a wire to said semiconductor chip.

B₃

8. (Amended) The sealed semiconductor device according to claim 7, wherein said semiconductor chip is substantially rectangular and has a pair of longer sides and a pair of shorter sides,

said active internal leads extend toward respective pads located proximate a central axis of said semiconductor chip across one of the longer pair of sides of said semiconductor chip, and

said dummy internal leads extend toward said semiconductor chip along and across one of the shorter pair of sides of said semiconductor chip.

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9. (Twice Amended) The sealed semiconductor device according to claim 4, wherein said protrusion contacts a peripheral area of said semiconductor chip.

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cont

10. (Twice Amended) A sealed semiconductor device comprising:
a semiconductor chip;
a lead frame including internal leads extending across part of and spaced from a surface of said semiconductor chip; and
a die pad on which said semiconductor chip is mounted, wherein said lead frame includes protrusions extending substantially perpendicular to and contacting said die pad.

11. (Twice Amended) A sealed semiconductor device comprising:
a semiconductor chip;
a lead frame including internal leads extending across part of and spaced from a surface of said semiconductor chip, and
a die pad on which said semiconductor chip is mounted, said die pad including fixed protrusions extending toward and contacting some of said internal leads.

B 5

16. (Amended) A lead frame for a sealed semiconductor device including a semiconductor chip having a substantially rectangular shape with a pair of longer sides and a pair of shorter sides and sealed in an encapsulating resin, the lead frame comprising:

internal leads extending toward and electrically connected with wires to respective pads located approximately along a central axis of the semiconductor chip; and

at least one dummy internal lead in direct contact with a surface of the semiconductor chip to ensure a fixed separation between the semiconductor chip and said internal leads, wherein

each internal lead extends across one of the longer sides of the semiconductor chip to the corresponding pad, and

each dummy lead extends across one of the longer sides of the semiconductor chip to reach a position opposite the semiconductor chip.

Add the following claims:

17. (New) The sealed semiconductor device according to claim 10, wherein said protrusions are peripheral to and do not contact said semiconductor chip.

18. (New) The lead frame according to claim 10, wherein said die pad is substantially rectangular and includes a pair of longer sides and a pair of shorter sides and said protrusions extend proximate the pair of longer sides of said die pad.

19. (New) The lead frame according to claim 10, wherein said die pad is substantially rectangular and includes a pair of longer sides and a pair of shorter sides and said protrusions extend proximate the pair of shorter sides of said die pad.

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~~20. (New) A sealed semiconductor device comprising:
a semiconductor chip;
a die pad on which said semiconductor chip is mounted;
a lead frame including internal leads extending across part of and spaced from a surface of said semiconductor chip; and
a tape member having a first surface to which said internal leads are entirely bonded and fixed, and a second surface not fixed to but contacting said semiconductor chip, to ensure a fixed distance between said semiconductor chip and said internal leads.~~

21. (New) A sealed semiconductor device comprising;
a semiconductor chip;
a lead frame including internal leads extending across part of and spaced from a surface of said semiconductor chip; and
a tape member located between said semiconductor chip and said internal leads to hold said semiconductor chip and said internal leads at a fixed distance from each other, said tape member having a first surface to which said internal leads are entirely bonded and fixed and a second surface, a part of the semiconductor chip contacting the surface of said semiconductor chip.

B₆ cont.

22. (New) A lead frame and tape for a sealed semiconductor device having a semiconductor chip sealed within an encapsulating resin, the lead frame comprising:

internal leads extending toward and electrically connected with wires to respective pads located approximately along a central axis of the semiconductor chip; and

a tape member having a first surface to which said internal leads are fixed, said tape member being arranged at a position where a portion of a second surface of said tape member contacts a surface of the semiconductor chip when the semiconductor chip is sealed within the encapsulating resin.

REMARKS

In response to the Examiner's Action mailed November 1, 2001, Applicants amend their application and request reconsideration. In this Amendment, claims 1-3 and 12-15 are cancelled and claims 17-22 are added so that claims 4-11, and 16-22 are now pending.

In this Amendment, all remaining examined claims have been amended for clarity. These amendments overcome all of the non-prior art rejections which are based upon translational errors in the claims that were not detected in time to be corrected in the Preliminary Amendment.

The drawings were objected to as not showing "semiconductor chip portions". Clearly, the plural reference to semiconductor chips was inadvertent. No reference to multiple semiconductor chips is made in the amended claims, overcoming the objection to the drawings. Reference was also made to the term "almost rectangular semiconductor chip portions" in claim 3, but that language appears in claim 8. The language is amended to refer to a substantially rectangular semiconductor chip having a pair of longer sides and a pair of shorter sides. This language is not indefinite and conforms to, for example, the embodiments of Figures 7, 9, and 11-16 of the patent application.

Claim 6 was objected to as informal with regard to certain language that no longer appears in that claim. An effort has been made to eliminate the word "portion" in all of its forms from the claims to avoid confusion.

Claim 1-12 were rejected pursuant to 35 USC 112, first paragraph, as not enabled by the original disclosure. This rejection is overcome by the amendment of the claims as to form referring to a sealed semiconductor device comprising a semiconductor chip, not chip portions. The amended claim language clearly conforms to the original disclosure. A similar rejection pursuant to 35 USC 112, second paragraph, is likewise overcome.

Claims 4-11 and 16 were rejected as anticipated by Murakami et al. (U. S. Patent 5,612,569, hereinafter Murakami). This rejection is respectfully traversed.

The previously examined claims now presented include four independent claims, claims 4, 10, 11, and 16. If Murakami does not anticipate any of those claims, it cannot anticipate any of the other claims now pending and previously examined nor the former and new claims depending from those claims.

In this Amendment, claim 4 is rewritten as an independent claim. Amended claim 4 is supported by many figures of the application, particularly Figures 6-9, and the discussion that relates to those figures. In each of the structures illustrated in those and related figures, at least one inner lead has at least one bent portion and bears upon the semiconductor chip to hold the semiconductor chip in place. Sometimes this lead, not electrically connected to the semiconductor chip, is referred to as a dummy lead whereas other internal leads are electrically connected to the semiconductor chip, usually at respective pads aligned along a central axis of the chip. Also depending from claim 4 is claim 8 which specifies that the semiconductor chip is substantially rectangular and that the dummy leads extend onto the semiconductor chip across the shorter sides of the chip whereas the other internal leads extend across the longer sides of the semiconductor chip. The contacting portions of the dummy leads may be the ends of the leads or may be intermediate curved portions remote from the ends of the leads. Embodiments of the latter structure are illustrated in Figures 9, 12, and 14 of the patent application.

Nothing similar is illustrated nor described in Murakami and, therefore, Murakami cannot anticipate claim 4 nor any of its dependent claims 5-9.

Claim 10 has been rewritten in independent form and claims 17-19 have been added as dependent claims depending from claim 10. Claims 10 and 17-19 are supported by the embodiments of the invention illustrated in Figures 22-26 of the patent application and the associated description of those figures. Murakami does not describe nor illustrate any structure in which inner leads of the lead frame are bent transverse to and are in contact with a die pad to provide support for the structure in the course of resin encapsulation. In fact, the entire thrust of Murakami is to avoid a die pad, showing that Murakami cannot even suggest claims 10 and 17-19.

Claim 11 is now written in independent form and is supported by at least the disclosure in the patent application pertaining to Figures 26 and 27. In the claimed structure, protrusions extend from the die pad and support internal leads with which the

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protrusions are in contact. Nothing similar is described nor suggested by Murakami which avoids the use of a die pad altogether. Therefore, claim 11 is clearly patentable over Murakami.

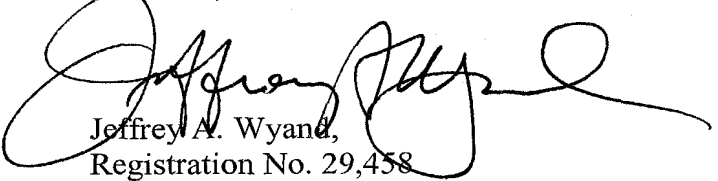
Claim 16 is an independent claim directed to the lead frame, free of the semiconductor chip that is, for example, described with respect to Figures 7, 9, and 11-16. As already stated with respect to independent claim 4, which has similarities to independent claim 16, Murakami neither describes nor suggests the structure described by that claim. Accordingly, the original rejection cannot be maintained as to claim 16 as now presented.

New claims 20-22 are supported by the original disclosure. These claims are supported by the original disclosure with regard to Figures 1 and 2 and pages 9-11 of the patent application.

Since all claims now pending are clearly patentable over Murakami, prompt and favorable action on the merits is earnestly solicited.

Respectfully submitted,

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**SPECIFICATION, CLAIMS, AND ABSTRACT AS AMENDED
IN RESPONSE TO THE OFFICIAL ACTION MAILED NOVEMBER 1, 2001**

Amendments to existing claims:

4. (Twice Amended) ~~The~~A sealed semiconductor device ~~according to claim 1,~~
~~wherein said holding members include protrusions comprising:~~
a semiconductor chip; and
a lead frame including internal leads extending across part of and spaced from a
surface of said semiconductor chip, wherein at least one of said internal leads includes a
protrusion protruding toward and contacting the surface of said semiconductor chip
~~portions and provided in said internal lead portions.~~

5. (Twice Amended) The sealed semiconductor device according to claim 4,
~~wherein said protrusions are bends in~~ protrusion is an end of at least one of said internal
~~lead portions~~ leads that includes a bend proximate the end.

6. (Twice Amended) The sealed semiconductor device according to claim ~~5~~ 4, wherein ~~crest portions of the bends~~ said protrusion includes a bent portion of one of said internal leads ~~contact said semiconductor chip portions~~ spaced from an end of said internal lead.

7. (Twice Amended) The sealed semiconductor device according to claim 4, wherein said internal ~~lead portions~~ leads include ~~an original active internal lead~~ leads electrically connected with wires to said semiconductor chip portions and ~~dummy internal leads~~, and ~~said protrusions are~~ protrusion is part of said a dummy internal lead portions not connected by a wire to said semiconductor chip.

8. (Amended) The sealed semiconductor device according to claim 7, wherein said semiconductor chip ~~portions are almost~~ is substantially rectangular, and has a pair of longer sides and a pair of shorter sides,

~~said original active internal lead is set~~ leads extend toward a pad portion formed nearby centers respective pads located proximate a central axis of said rectangular semiconductor chip portions from a across one of the longer pair of faced sides of said semiconductor chip portions, and

said dummy internal leads are arranged extend toward the said semiconductor chip portions from along and across one of the other shorter pair of sides facing the direction almost orthogonal to of said pair of faced sides semiconductor chip.

9. (Twice Amended) The sealed semiconductor device according to claim 4, wherein ~~said protrusions contact areas~~ protrusion contacts a peripheral to area of said semiconductor chip portions.

10. (Twice Amended) ~~The~~ A sealed semiconductor device ~~according to claim 9,~~ wherein ~~said~~ comprising:

a semiconductor chip portions include a semiconductor chip body;

a lead frame including internal leads extending across part of and spaced from a surface of said semiconductor chip; and

a die pad for mounting on which said semiconductor chip body, and said is mounted, wherein said lead frame includes protrusions-contact extending substantially perpendicular to and contacting said die pad.

11. (Twice Amended) ~~The~~A sealed semiconductor device ~~according to claim 1,~~
~~wherein said comprising:~~

a semiconductor chip portions include a semiconductor chip body;

a lead frame including internal leads extending across part of and spaced from a surface of said semiconductor chip, and

a die pad for mounting on which said semiconductor chip body is mounted, and said holding members include protrusions fixed to said die pad and protruding including fixed protrusions extending toward and contacting some of said internal leads.

16. (Amended) ~~The~~A lead frame ~~according to claim 15, wherein said for a sealed semiconductor device including a semiconductor chip having a substantially rectangular shape with a pair of longer sides and a pair of shorter sides and sealed in an encapsulating resin, the lead frame comprising:~~

internal lead portions is set leads extending toward said pad portion of almost rectangular and electrically connected with wires to respective pads located approximately along a central axis of the semiconductor chip portions from a pair of faced sides of the almost rectangular semiconductor chip portions; and

said holding at least one dummy internal lead portions are arranged toward said in direct contact with a surface of the semiconductor chip portions from the other pair of sides facing the direction almost orthogonal to said pair of faced sides to ensure a fixed separation between the semiconductor chip and said internal leads, wherein

each internal lead extends across one of the longer sides of the semiconductor chip to the corresponding pad, and

each dummy lead extends across one of the longer sides of the semiconductor chip to reach a position opposite the semiconductor chip.

Add the following claims:

17. (New) The sealed semiconductor device according to claim 10, wherein said protrusions are peripheral to and do not contact said semiconductor chip.

18. (New) The lead frame according to claim 10, wherein said die pad is substantially rectangular and includes a pair of longer sides and a pair of shorter sides and said protrusions extend proximate the pair of longer sides of said die pad.

19. (New) The lead frame according to claim 10, wherein said die pad is substantially rectangular and includes a pair of longer sides and a pair of shorter sides and said protrusions extend proximate the pair of shorter sides of said die pad.

20. (New) A sealed semiconductor device comprising:
a semiconductor chip;
a die pad on which said semiconductor chip is mounted;
a lead frame including internal leads extending across part of and spaced from a surface of said semiconductor chip; and
a tape member having a first surface to which said internal leads are entirely bonded and fixed, and a second surface not fixed to but contacting said semiconductor chip, to ensure a fixed distance between said semiconductor chip and said internal leads.

21. (New) A sealed semiconductor device comprising;
a semiconductor chip;
a lead frame including internal leads extending across part of and spaced from a surface of said semiconductor chip; and
a tape member located between said semiconductor chip and said internal leads to hold said semiconductor chip and said internal leads at a fixed distance from each other, said tape member having a first surface to which said internal leads are entirely bonded and fixed and a second surface, a part of the semiconductor chip contacting the surface of said semiconductor chip.

22. (New) A lead frame and tape for a sealed semiconductor device having a semiconductor chip sealed within an encapsulating resin, the lead frame comprising:

- internal leads extending toward and electrically connected with wires to respective pads located approximately along a central axis of the semiconductor chip; and
- a tape member having a first surface to which said internal leads are fixed, said tape member being arranged at a position where a portion of a second surface of said tape member contacts a surface of the semiconductor chip when the semiconductor chip is sealed within the encapsulating resin.